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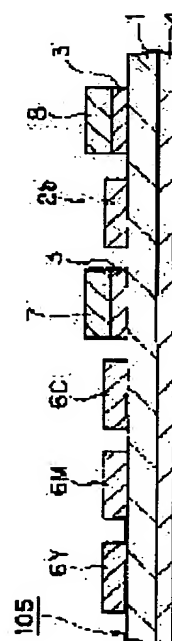
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## (54) THERMAL TRANSFER SHEET, METHOD FOR THERMALLY TRANSFERRING, AND PRINTED MATTER

(57)Abstract:

PROBLEM TO BE SOLVED: To impart a higher forgery preventing function than prior art to an article by utilizing an achromatic fluorescent agent.

SOLUTION: A thermal transfer sheet comprises a fluorescent color transfer layer containing a plurality of types of organic fluorescent agents for generating fluorescences of substantially achromatic color by irradiating with a visible light, and different color tones by irradiating with an ultraviolet ray. A method for thermally transferring comprises the steps of preparing the thermal transfer sheet, opposing the transfer layer of the sheet to a surface to be printed, superposing the layer with the surface, heating and heat transferring the agents to the surface to be printed to form an image for color developing the fluorescent color of the mixed color.



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**[Claim(s)]**

**[Claim 1] A hot printing sheet characterized by coming to prepare a fluorescence color imprint layer containing two or more sorts of organic fluorescence agents which emit fluorescence of a color tone which is colorlessness mostly and is mutually different to an exposure of ultraviolet rays to an exposure of the light on a base material film.**

**[Claim 2] The aforementioned fluorescence color imprint layer is a hot printing sheet according to claim 1 characterized by being a heat-of-fusion imprint mold fluorescence ink layer containing an organic fluorescence agent.**

**[Claim 3] The aforementioned fluorescence color imprint layer is a hot printing sheet according to claim 1 characterized by being a heat-of-sublimation imprint mold fluorescent dye layer containing an organic fluorescence agent.**

**[Claim 4] claim 1 characterized by coming to prepare Junji Men a coloring agent imprint layer which contains a coloring agent which can further be checked by looking by the exposure of the light with said fluorescence color imprint layer on the same base material film thru/or 3 -- a hot printing sheet given in either.**

**[Claim 5] claim 1 characterized by coming to prepare Junji Men a thermofusion black ink layer which consists of thermofusion nature black ink further with said fluorescence color imprint layer on the same base material film thru/or 4 -- a hot printing sheet given in either.**

**[Claim 6] claim 1 characterized by coming to prepare Junji Men an imprint nature protective layer on the same base material film further with said fluorescence color imprint layer thru/or 5 -- a hot printing sheet given in either.**

**[Claim 7] A hot printing sheet which comes to prepare a fluorescence color imprint layer containing two or more sorts of organic fluorescence agents which emit fluorescence of a color tone which is colorlessness mostly and is mutually different to an exposure of ultraviolet rays to an exposure of the light on a base material film is prepared. By opposing a fluorescence color imprint layer of the above-mentioned hot printing sheet to an image formation field of a printed side, heating said fluorescence color imprint layer according to superposition and image information which should be printed, and**

carrying out the heat shift of the organic fluorescence agent to a printed side A hot printing method characterized by forming an image which emits a fluorescence color which is color mixture by the exposure of ultraviolet rays.

[Claim 8] A fluorescence color imprint layer of said hot printing sheet is the hot printing method according to claim 7 which is a heat-of-fusion imprint mold fluorescence ink layer containing an organic fluorescence agent, and is characterized by carrying out the heat shift of the organic fluorescence agent of the heat-of-fusion imprint mold fluorescence ink layer concerned to a printed side the whole ink.

[Claim 9] A fluorescence color imprint layer of said hot printing sheet is the hot printing method according to claim 7 which is a heat-of-sublimation imprint mold fluorescent dye layer containing an organic fluorescence agent, and is characterized by carrying out thermal diffusion of the organic fluorescence agent of the heat-of-fusion imprint mold fluorescence ink layer concerned to a printed side.

[Claim 10] Said hot printing sheet comes to prepare Junji Men a coloring agent imprint layer which contains a coloring agent which can further further be checked by looking by the exposure of the light with said fluorescence color imprint layer on the same base material film. By opposing said coloring agent imprint layer of the above-mentioned hot printing sheet to an image formation field of said printed side, heating the coloring agent imprint layer concerned according to superposition and image information which should be printed, and carrying out the heat shift of the coloring agent claim 7 characterized by forming an image which can be recognized by the exposure of the light with said image which emits a fluorescence color by the exposure of ultraviolet rays thru/or 9 -- a hot printing method given in either.

[Claim 11] Said hot printing sheet comes to prepare Junji Men a thermofusion black ink layer which consists of thermofusion nature black ink further with said fluorescence color imprint layer on the same base material film. Said thermofusion black ink layer of the above-mentioned hot printing sheet is opposed to an image formation field of said printed side. Superposition, With said image which emits a fluorescence color by the exposure of ultraviolet rays by heating the thermofusion black ink layer concerned according to image information which should be printed, and carrying out the heat shift of the thermofusion nature black ink claim 7 characterized by forming a black image which can be recognized by the exposure of the light thru/or 10 -- a hot printing method given in either.

[Claim 12] claim 7 characterized by for said hot printing sheet to cover said image formation field by coming to prepare Junji Men an imprint nature protective layer on the same base material film further, opposing said imprint nature protective layer of the above-mentioned hot printing sheet to an image formation field of said printed side,

and carrying out the heat shift of superposition and the imprint nature protective layer concerned with said fluorescence color imprint layer thru/or 11 -- a hot-printing method given in either.

[Claim 13] A print object formed by said hot printing method according to claim 7 to 12.

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the hot printing sheet used for the hot printing method which contributes to forged prevention of the large goods of assets-value, such as cards, such as important documents, such as negotiable securities and a bill, an ID card, and a credit card, and the method concerned, and the print object created using it.

[0002]

[Description of the Prior Art] The forged prevention technique, such as negotiable securities, a bill, an ID card, and a credit card, is known variously. For example, an alphabetic character and an image are formed by special color material, such as ink of the gold which can print neither a detailed alphabetic character nor a \*\*\*\* pattern, or cannot be reproduced in the three primary colors, a silver imprint foil and a pastel tone, or a pearl tone, and fluorescence color ink, or preparing the hologram image which needs an advanced manufacturing technology is performed so that it may be difficult to copy.

[0003] Moreover, it hardly has absorption to the light, but colorlessness or the technique of forming visually the image which cannot be distinguished in anticipated-use environment, verifying the existence of a fluorescence image using an ultraviolet ray lamp etc., and performing a truth-or-falsehood judging using the fluorescence agent which will emit the fluorescence of the light if ultraviolet rays are irradiated, though it is white, is also performed mostly.

[0004] The thermal-ink-transfer-printing sheet which used such a fluorescence agent is indicated by JP,62-111800,A. Moreover, the hot printing sheet which divided and prepared the special-feature imprint layer which contains heat translatability fluorescent dye with the heat translatability color layer of black in addition to the three primary colors of red, blue, and green or this on the continuation sheet is indicated by JP,8-207452,A. Moreover, JP,2000-158823,A is shown the hot printing sheet which has the inorganic colorlessness fluorescence agent imprint layer of two or more colors. Since the thermal-ink-transfer-printing printer has spread also through office or a home widely, according to the thermal-ink-transfer-printing recording method, the forged prevention information on arbitration can be formed in a desired printed object

comparatively easily, without requiring equipment of a large-scale printing machine etc.  
[0005]

[Problem(s) to be Solved by the Invention] It hardly has absorption to the above lights, but it is almost possible colorlessness or to completely forge, if \*\*\*\* uses the almost same color material even if it uses the fluorescence agent ("a colorless fluorescence agent" is called below) which will emit the fluorescence of the light if ultraviolet rays are irradiated, though it is white in principle. Although the color tone of a colorless fluorescence agent known now is mostly divided roughly into three colors of red, blue, and green in practice, the color tone of the fluorescence agent of each color is similar even if the manufacturers differ. For example, the thing near 615nm has common luminescence wavelength, and the colorless fluorescence agent which carries out luminescence of red is difficult for distinguishing them visually. Therefore, a forger may be able to forge because not the colorless fluorescence agent itself currently used for the "genuine article" but a similar colorless fluorescence agent comes to hand.

[0006] This invention is finished in view of the above-mentioned actual condition, and aims at giving a forged prevention function still more advanced than before to goods using a colorless fluorescence agent.

[0007]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, a hot printing sheet offered by this invention is characterized by coming to prepare a fluorescence color imprint layer containing two or more sorts of organic fluorescence agents which emit fluorescence of a color tone which is colorlessness mostly and is mutually different to an exposure of ultraviolet rays to an exposure of the light on a base material film.

[0008] Moreover, a hot-printing method offered by this invention is characterized by to form an image which emits a fluorescence color which is color mixture by the exposure of ultraviolet rays by opposing a fluorescence color imprint layer of a hot printing sheet concerning above-mentioned this invention to an image formation field of a printed side, heating said fluorescence color imprint layer according to superposition and image information which should be printed, and carrying out the heat shift of the organic fluorescence agent to a printed side.

[0009] Moreover, a print object offered by this invention is formed by hot printing method concerning above-mentioned this invention.

[0010] According to a hot printing method concerning this invention, a fluorescence agent which emits fluorescence of a color tone which is colorlessness mostly and is mutually different to an exposure of ultraviolet rays to an exposure of the light into an image formation field of a printed side from a fluorescence color imprint layer contained

two or more sorts By carrying out the heat shift of the mixture of a colorless fluorescence agent, by the light, a fluorescence image which has a color tone of arbitration which cannot be recognized can be formed, and high forged tightness can be given to a print object.

[0011] business concerning this invention -- for example, hot printing of the fluorescence agent may be carried out the whole ink, using a heat-of-fusion imprint mold fluorescence ink layer as a fluorescence color imprint layer of a hot printing sheet, and hot printing only of the fluorescence agent may be carried out using a heat-of-sublimation imprint mold fluorescent dye layer.

[0012] It is desirable that it can be made to carry out hot printing of 1 of an image which prepares Junji Men 1 of a coloring agent imprint layer, a thermofusion black ink layer, or imprint nature protective layers or two or more, and can be recognized [ layer / fluorescence color imprint ] by the exposure of the light with a fluorescence image using the same hot printing sheet, a visible image of black ink, or imprint nature protective layers, or two or more to the above-mentioned hot printing sheet.

[0013]

[Embodiment of the Invention] This invention is explained in detail below. In this invention, the image which emits the fluorescence of the new color tone by which color mixture was carried out with the principle of additive mixture of colors is printed using the hot printing sheet which comes to prepare the fluorescence color imprint layer containing two or more sorts of organic fluorescence agents (namely, organic system colorlessness fluorescence agent) which emit the fluorescence of a color tone which is colorlessness mostly and is mutually different to the exposure of ultraviolet rays to the exposure of the light on a base material film. For example, hot printing of the fluorescence agent may be carried out the whole ink, using a heat-of-fusion imprint mold fluorescence ink layer as a fluorescence color imprint layer, and hot printing only of the fluorescence agent may be carried out using a heat-of-sublimation imprint mold fluorescent dye layer.

[0014] It is desirable that it can be made to carry out hot printing of 1 of the image which prepares Junji Men 1 of a coloring agent imprint layer, a thermofusion black ink layer, or imprint nature protective layers or two or more, and can be recognized [ layer / fluorescence color imprint ] by the exposure of the light with a fluorescence image using the same hot printing sheet, the visible image of black ink, or imprint nature protective layers, or two or more to the above-mentioned hot printing sheet. As a coloring agent imprint layer, the color layer in which a heat-of-sublimation imprint is possible, and the thermofusion nature ink layer in which a heat-of-fusion imprint is possible can be prepared, for example. Moreover, a coloring agent imprint layer may choose two or more

as arbitration from the color tones of yellow (Y), a Magenta (M), cyanogen (C), or others, and may prepare it for Junji Men with other imprint layers.

[0015] First, the hot printing sheet used for this invention is explained. Drawing 1 is the typical cross section of an example (101) of the hot printing sheet used for the hot printing method of this invention. The hot printing sheet 101 prepared heat-of-fusion imprint mold fluorescence ink layer 2a in the whole surface of the base material film 1 through the mold release layer 3, and, on the other hand, has taken the configuration which formed the heat-resistant layer 4 for [ of this base material film 1 ] planning a sticking prevention and slipping disposition top with heating elements, such as a thermal head, to a side. A heat-of-fusion imprint mold fluorescence ink layer chooses two or more sorts as arbitration from fluorescence agents, such as red (R), blue (B), or green (G), a thermofusion nature vehicle is dissolved or distributed and they carry out coating on a base material film, and by heating this, it can make a printed side able to carry out the heat shift of two or more mixture of the fluorescence agent of a seed the whole ink, and can print the fluorescence color of color mixture.

[0016] Moreover, as described above, in this invention, it is also possible to print the fluorescence color which carried out color mixture of the two or more colors with the fluorescence color imprint layer on the base material film of the same hot printing sheet using the hot printing sheet which comes to prepare Junji Men a coloring agent imprint layer like a thermofusion nature ink layer, a thermofusion nature black ink layer, or a sublimability color layer or an imprint nature protective layer. It becomes possible on a continuation sheet-like hot printing sheet to imprint not only a fluorescence color but a general coloring agent, a general protective layer, etc. which can be checked by looking by the exposure of the light from the hot printing sheet of one volume in the same printed side by preparing Junji Men the coloring agent imprint layer and imprint nature protective layer of one color or two colors or more with a fluorescence color imprint layer, rolling round in the shape of a roll, and attaching in a thermal-ink-transfer-printing printer, and is effective in the miniaturization of a printer, and simplification In forming in the same printed side the colored image which can be checked by looking under the light with the fluorescence color image which can be checked by looking only under ultraviolet rays The fluorescence agent imprint production process by the fluorescence color imprint layer, and the color-material imprint production process by coloring agent imprint layer like a thermofusion ink layer, a thermofusion black ink layer, and a sublimability color layer Although whichever may be performed first, after printing a colored image previously so that a fluorescence color image may not be concealed with the usual colored image, it is desirable to print a fluorescence color image.



[0017] Drawing 2 - drawing 5 are the typical cross sections of the example of a configuration of the hot printing sheet used in this case (102-105). the hot printing sheet 102 of drawing 2 -- the whole surface of the base material film 1 -- yellow (Y), a Magenta (M), or cyanogen (C) -- the configuration which was made to arrange in parallel three sorts of color layers (5Y, 5M, 5C) containing one of sublimability colors and heat-of-fusion imprint mold fluorescence ink layer 2a along the direction of a film advance at the time of hot printing in Junji Men, i.e., the same base material film top, and prepared them is taken. In the hot printing sheet 102 of drawing 2 , although the color layer (5Y, 5M, 5C) is directly formed on the base material film 1, heat-of-fusion imprint mold fluorescence ink layer 2a which adjoins this is formed through the mold release layer 3 on the base material film. Moreover, the heat-resistant layer 4 is formed in the back side of the base material film of the hot printing sheet 102 like the hot printing sheet 101 of above-mentioned drawing 1 .

[0018] the hot printing sheet 103 of drawing 3 -- the whole surface of the base material film 1 -- the mold release layer 3 -- preparing -- further -- the mold release layer concerned -- minding -- yellow (Y), a Magenta (M), or cyanogen (C) -- the configuration which prepared Junji Men three sorts of thermofusion nature ink layers (6Y, 6M, 6C) containing one of coloring agents, the thermofusion black ink layer 7, and heat-of-fusion imprint mold fluorescence ink layer 2a is taken. Moreover, the heat-resistant layer 4 is formed in the back side of the base material film of the hot printing sheet 103 like the hot printing sheet 101 of above-mentioned drawing 1 .

[0019] the hot printing sheet 104 of drawing 4 -- the whole surface of the base material film 1 -- yellow (Y), a Magenta (M), or cyanogen (C) -- three sorts of color layers (5Y, 5M, 5C) containing one of sublimability colors, heat-of-fusion imprint mold fluorescence ink layer 2a, and the configuration that prepared Junji Men the imprint nature protective layer 8 are taken. In the hot printing sheet 104 of drawing 4 , although the color layer (5Y, 5M, 5C) is directly formed on the base material film 1, heat-of-fusion imprint mold fluorescence ink layer 2a and the imprint nature protective layer 8 which adjoin this are prepared through the mold release layer 3 on the base material film. Moreover, the heat-resistant layer 4 is formed in the back side of the base material film of the hot printing sheet 104 like the hot printing sheet 101 of above-mentioned drawing 1 .

[0020] the hot printing sheet 105 of drawing 5 -- the whole surface of the base material film 1 -- yellow (Y), a Magenta (M), or cyanogen (C) -- heat-of-sublimation imprint mold fluorescent dye layer 2b containing the colorless fluorescence agent containing one of sublimability colors of three sorts of color layers (5Y, 5M, 5C) and 7 or 2 or more sorts of thermofusion black ink layers and the configuration which prepared Junji Men the imprint nature protective layer 8 are taken.

[0021] In the hot printing sheet 105 of drawing 5 , although a color layer (5Y, 5M, 5C) and heat-of-sublimation imprint mold fluorescent dye layer 2b are directly formed on the base material film 1, the thermofusion black ink layer 7 and the imprint nature protective layer 8 which adjoin these are prepared through the mold release layer 3 on the base material film. Moreover, the heat-resistant layer 4 is formed in the back side of the base material film of the hot printing sheet 105 like the hot printing sheet 101 of above-mentioned drawing 1 .

[0022] The fluorescence color imprint layer of the hot printing sheet 105 is a sublimation mold imprint layer, by dissolving or distributing the vehicle of un-imprinting nature, carrying out coating of the organic system colorlessness fluorescence agent in which sublimability is high and a heat-of-sublimation imprint is possible on a base material film, and heating this, the heat shift only of the fluorescence agent can be carried out from a fluorescence color imprint layer to a printed side, and an un-imprinting nature vehicle remains as it is on a hot printing sheet.

[0023] By setting a color layer under the light, making the vehicle of un-imprinting nature dissolve or distribute a colored sublimability color, carrying out coating on a base material film, and heating this, the heat shift only of the color can be carried out from a color layer to a printed side, and an un-imprinting nature vehicle remains as it is on a hot printing sheet.

[0024] Since the fluorescence color imprint layer and the color layer of a sublimation mold do not have the necessity of carrying out the heat shift of the whole imprint layer containing a vehicle, in order that there may be no necessity of preparing on a base material film through a mold release layer and it may raise the adhesion between an un-imprinting nature vehicle and a base material film rather, it is desirable to perform improvement processing in adhesion of carrying out corona discharge treatment of the base material film, or making a primer layer intervene etc.

[0025] Next, each part which constitutes the hot printing sheet concerning this invention is explained in detail. First, as a base material film which constitutes the hot printing sheet of this invention, the thermal resistance which can bear a hot printing process, and the film material which has film reinforcement can be chosen suitably, and can be used, and what is used for the conventional hot printing sheet can be used satisfactory in this invention. As an example of a desirable base material film, glassine, a condenser paper, Thin papers, such as paraffin paper; Polyethylene terephthalate, polyethylenenaphthalate, Polybutylene terephthalate, polyphenylene sulfide, a polyether ketone, Heat-resistant high polyester, such as polyether sulphone, polypropylene, The derivative of a polycarbonate, cellulose acetate, and polyethylene, a polyvinyl chloride, The extension which consists of various plastic material, such as a

polyvinylidene chloride, polystyrene, a polyamide, the poly methyl pentene, and an ionomer, or unstretched film;, and the laminated film which combined each above-mentioned material can be mentioned.

[0026] The thickness of a base material film can be suitably chosen according to a material so that physical properties, such as reinforcement of a film and thermal resistance, may become suitable, and an about 1-100-micrometer thing is usually used preferably.

[0027] By setting to this invention, a fluorescence agent imprint layer is a layer which makes a vehicle dissolve or come to distribute a fluorescence agent, and to the exposure of the light, although it is colorlessness mostly, it contains at least two or more sorts of fluorescence agents (namely, colorless fluorescence agent) and binder resin which emit the fluorescence of a visible color to the exposure of ultraviolet rays. In addition, when "it is colorlessness mostly" prints using the fluorescence agent concerned in this invention, no matter the ground color of a printed side may be what color tone, in the bottom of the light, a check by looking of existing is difficult and the contents of printing are defined as what means that it cannot distinguish at all.

[0028] Various things are known as a colorless fluorescence agent, in this invention, if it is the colorless fluorescence agent of an organic system, especially, it is not limited but what is marketed can be used effectively. Although there are the organic substance and an inorganic substance in a colorless fluorescence agent, an organic colorlessness fluorescence agent is used in this invention. Since an organic colorlessness fluorescence agent can be compatibility-ized with binder resin and a solvent and can make thermofusion nature ink transparence, when it excels in the invisibility under the light and a heat-of-fusion imprint is performed using an organic colorlessness fluorescence agent, it cannot discover easily that fluorescence agent printing for forged prevention is given in the anticipated-use condition of a print object. Moreover, since the organic colorlessness fluorescence agent excels [ itself ] in transparency also when performing a heat-of-sublimation imprint using an organic colorlessness fluorescence agent, it is hard to discover that fluorescence agent printing for forged prevention is given in the anticipated-use condition of a print object.

[0029] On the other hand, an inorganic colorlessness fluorescence agent is a solid-state particle, since it is insoluble to a solvent, resin, etc., when it mixes to binder resin and a solvent and it forms a paint film, it causes light scattering between particles, presents white in many cases, and is inferior to the achromatism under the light, transparency, and invisibility. Therefore, supposing it uses an inorganic colorlessness fluorescence agent, the ground color of a printed side will be concealed under the light, and it will be easy to discover that fluorescence agent printing for forged prevention is given in the

anticipated-use condition of a print object. For this reason, an organic colorlessness fluorescence agent is used by this invention.

[0030] Among fluorescence agent imprint layers, a heat-of-fusion imprint mold fluorescent ink layer is formed of the thermofusion nature fluorescent ink which makes the hot printing nature vehicle which uses the binder resin of thermofusion nature as a principal component dissolve or come to distribute an organic system colorlessness fluorescence agent, and can carry out the heat shift of the fluorescence agent of a fluorescence color imprint layer to a printed side with a vehicle.

[0031] The thing using the organic colorlessness fluorescence agent as thermofusion nature fluorescence ink can be effectively used among commercial colorless fluorescence ink. For example, company MR-30 grade can be illustrated as the company make R-70 and blue coloring fluorescence ink as red coloring fluorescence ink as the product R-50 made from SHINROIHI, and green coloring fluorescence ink.

[0032] Moreover, a commercial organic colorlessness fluorescence agent can be distributed or dissolved in thermofusion nature binder resin etc., and thermofusion nature fluorescence ink can also be prepared. as a commercial colorless fluorescence agent -- as for example, a red coloring fluorescence agent -- the Nippon Kayaku Co., Ltd. make -- as LC-0001 and a green coloring fluorescence agent -- the Mitsui Chemicals, Inc. make -- Ciba-Geigy YUBITEKKUSU alumnus etc. can be illustrated as EG-502 and a blue coloring fluorescence agent.

[0033] Since the combination component of the thermofusion nature binder resin and others which form a hot printing nature vehicle shifts to a printed side with an organic colorlessness fluorescence agent, in order not to spoil the visibility of the image of a printed side, it is desirable to use what has transparency high as much as possible, and, as for the thermofusion nature binder resin which is especially the principal component of a vehicle, it is desirable that it is substantially transparent and colorless under the light.

[0034] That which transparency is high, fuses at the heating temperature of a hot printing process as binder resin of thermofusion nature, and can be welded to a printed side is used. Specifically, the mixture of polyester resin, polystyrene resin, acrylic resin, polyurethane resin, acrylic urethane resin, vinyl chloride system resin, vinyl acetate system resin, a vinyl chloride / vinyl acetate copolymerization resin, polyamide system resin, the resin that carried out silicone denaturation of each of these resin, and each of these resin etc. can be used.

[0035] Other components may be blended with a heat-of-fusion imprint mold fluorescent ink layer if needed. For example, the foil piece nature at the time of an imprint can be raised by blending non-subtlety particles, such as a silica, with a heat-of-fusion imprint

mold fluorescent ink layer.

[0036] What is necessary is just to determine suitably the colorless fluorescence agent in a heat-of-fusion imprint mold fluorescent ink layer, and the blending ratio of coal of binder resin according to the demand on the engine performance. Since it depends for the luminescence reinforcement of the fluorescence color by UV irradiation on the abundance of a colorless fluorescence agent, such clear color can be expressed that the blending ratio of coal is large. However, since it is expensive compared with a general color material, if many colorless fluorescence agents beyond necessity are blended, they are uneconomical. Moreover, if the blending ratio of coal of a colorless fluorescence agent is enlarged not much when compatibility with the binder resin of a colorless fluorescence agent is not high, the evil of a colorless fluorescence agent depositing in a heat-of-fusion imprint mold fluorescent ink layer will arise. These are taken into consideration, about 0.01 to 50% of the weight, as for especially the blending ratio of coal of the colorless fluorescence agent in thermofusion nature fluorescence ink, it is desirable to consider [ of the whole thermofusion nature fluorescence ink concerned ] as about 0.1 - 20 % of the weight, and it is desirable to make [ of the whole thermofusion nature fluorescence ink concerned ] especially the blending ratio of coal of binder resin into about 80 - 99.9 % of the weight about 50 to 99.99% of the weight.

[0037] There is no special constraint in the compounding ratio of two or more colorless fluorescence agents, and in order to acquire a desired color tone, two sorts, three sorts, or the colorless fluorescence agent beyond it can be blended at a rate of arbitration. For example, what is necessary is just to blend red, green, and the colorless fluorescence agent of each blue at a rate that respectively equivalent luminescence reinforcement is obtained, if you want to acquire white fluorescence. Moreover, the color tone of a cyanogen network can be expressed in as blue in as blue in the combination of red and green a combination as a yellow network and red a combination as a Magenta network and green.

[0038] 0.2-5 micrometers of thickness of a heat-of-fusion imprint mold fluorescent ink layer are usually preferably set to 0.4-3 micrometers. When the thickness of a heat-of-fusion imprint mold fluorescent ink layer does not fulfill 0.2 micrometers, it becomes lacking in the homogeneity of a bed depth, and coloring nonuniformity is promoted. On the other hand, when the thickness of a heat-of-fusion imprint mold fluorescent ink layer exceeds 5 micrometers, the foil piece at the time of an imprint gets worse, and there is a possibility that the fault that a heat-of-fusion imprint mold fluorescent ink layer is imprinted besides a desired field may arise.

[0039] In order to form a heat-of-fusion imprint mold fluorescent ink layer on a base material film, a colorless fluorescence agent, binder resin, and necessity can be accepted,

and it can form by carrying out coating of the coating liquid dissolved, or distributed and obtained by independent solvents or these partially aromatic solvents, such as toluene, a methyl ethyl ketone, ethyl acetate, and isopropanol, in other components, and drying it on a base material film, by conventionally well-known methods, such as a gravure coat, a gravure reverse coat, and a roll coat.

[0040] Moreover, when forming a heat-of-fusion imprint mold fluorescent ink layer, a colorless fluorescence agent, thermofusion nature binder resin, and the coating material that blended other components if needed may not be dissolved with a solvent, but heating fusion may be carried out, and you may form by carrying out coating and cooling on a base material film, by conventionally well-known methods, such as a hot melt coat, a hot lacquer coat, a gravure coat, a gravure reverse coat, and a roll coat.

[0041] On the other hand, by a heat-of-sublimation imprint mold fluorescent dye layer's making the vehicle of un-imprinting nature dissolve or distribute the colorless fluorescence agent of sublimability, carrying out coating on a base material film, and heating this, thermal diffusion only of the organic fluorescence agent can be carried out from a fluorescence color imprint layer to a printed side, and an un-imprinting nature vehicle remains as it is on a hot printing sheet.

[0042] The fluorescence agent illustrated as what is used for the above-mentioned heat-of-fusion imprint mold fluorescent ink layer as an organic colorlessness fluorescence agent high sublimability and available to a heat-of-sublimation imprint can be used. An un-imprinting nature vehicle uses the binder resin of non-thermofusion nature as a principal component, and comes to blend other components if needed.

[0043] As binder resin of non-thermofusion nature, what is not fused is used at the heating temperature of a hot printing process. Are specifically used as binder resin for sublimation mold color layers from the former. Ethyl cellulose, hydroxyethyl cellulose, hydroxypropylcellulose, Cellulose system resin like methyl cellulose, cellulose acetate, and cellulose acetate butyrate; Polyvinyl alcohol, Polyvinyl acetate, a polyvinyl butyral, a polyvinyl acetal, a polyvinyl pyrrolidone, The mixture of these resin etc. can be illustrated. vinyl system resin; like the Pori (meta) acrylamide -- polyurethane resin; -- polyamide resin; -- polyester system resin; -- In these, the resin of a cellulose system, a vinyl-acetal system, a vinyl butyral system, and a polyester system is desirable from points, such as thermal resistance and color translatability.

[0044] Other components may be blended with a heat-of-sublimation imprint mold fluorescent dye layer if needed. For example, in order to prevent friction accommodation with a fluorescent dye layer and a transferred object, and blocking in the rolling-up condition, release agents, such as silicone oil and polyethylene wax, can be blended.

[0045] What is necessary is just to determine suitably the colorless fluorescence agent in

a heat-of-sublimation imprint mold fluorescent dye layer, and the blending ratio of coal of binder resin as well as the case of thermofusion nature fluorescent ink according to the demand on the engine performance. About 0.1 to 80% of the weight, as for especially the blending ratio of coal of a colorless fluorescence agent, it is desirable to consider [ of the whole fluorescent dye layer concerned ] as about 1 - 50 % of the weight, and it is desirable to make [ of the whole fluorescent dye layer concerned ] especially the blending ratio of coal of binder resin into about 50 - 99 % of the weight about 20 to 99.9% of the weight. Compared with the blending ratio of coal of the colorless fluorescence agent in the inside of a thermofusion nature fluorescent ink layer, the larger one of the blending ratio of coal of the colorless fluorescence agent in the inside of a fluorescent dye layer is desirable. The reason is that it is necessary to enlarge the fluorescence color content in an imprint layer in order to form a clear fluorescence color image, in order that not all the fluorescence agents in an imprint layer may shift to a transferred object in the case of sublimation mold hot printing and a certain amount of amount may remain in an imprint layer.

[0046] What is necessary is for there to be no special constraint in the compounding ratio of two or more colorless fluorescence agents, and just to blend two sorts, three sorts, or the colorless fluorescence agent beyond it at a rate of arbitration, in order to acquire a desired color tone also when forming a sublimation mold hot printing mold fluorescent dye layer.

[0047] 0.2-5 micrometers of thickness of a fluorescent dye layer are usually preferably set to 0.4-3 micrometers like said thermofusion nature fluorescent ink layer.

[0048] In order to form a fluorescent dye layer on a base material film, a colorless fluorescence agent, binder resin, and necessity can be accepted, and it can form by carrying out coating of the coating liquid dissolved, or distributed and obtained by independent solvents or these partially aromatic solvents, such as toluene, a methyl ethyl ketone, ethyl acetate, and isopropanol, in other components, and drying it on a base material film, by conventionally well-known methods, such as a gravure coat, a gravure reverse coat, and a roll coat.

[0049] In addition to a fluorescence color imprint layer, coloring agent imprint layers, such as yellow, a Magenta, cyanogen, and black, can be prepared for Junji Men at the hot printing sheet of this invention. As a coloring agent imprint layer, the color layer and thermofusion nature ink layer containing a sublimability color can be used.

[0050] A color layer can make the un-imprinting nature vehicle which uses the binder resin of non-thermofusion nature as a principal component able to dissolve or distribute a sublimability color, and can carry out the heat shift only of the sublimability color in a color layer to a printed side. Even when using a sublimability color for the same image

formation field within a printed side and forming a visible image in it after a sublimability color forms a fluorescence color image previously since transparency is high, it has the advantage referred to as that a fluorescence color image is not concealed with a visible image.

[0051] The sublimability color conventionally used for the hot printing sheet of a well-known heat-of-sublimation imprint method as a sublimability color can be used. As a yellow color, holon brilliant-yellow 6GL, PTY-52, and macro REXX yellow 6G grade can specifically be illustrated. As a red color The MS red G, the macro REXX red violet R, Ceres red 7B, the SAMARON red HBSL, SK Rubin SEGL, etc. can be illustrated. As a blue color The kaya set blue 714, WAKUSO phosphorus blue AP-FW, holon brilliant blue S-R, the MS blue 100, and die toe blue No.1 grade can be illustrated. Moreover, the color layer of the hue of arbitration, such as black, can be formed by combining the sublimability color of each above-mentioned hue.

[0052] Moreover, the thing same as the binder resin of the non-thermofusion nature of a color layer and other combination components as the un-imprinting nature vehicle of the fluorescent dye layer of the sublimation mold mentioned later can be used.

[0053] It is usually desirable that the blending ratio of coal of the sublimability color in a color layer takes [ of the whole color layer concerned ] preferably for about 10 - 70 % of the weight about 5 to 90% of the weight. 0.2-5 micrometers of thickness of a color layer are usually preferably set to 0.4-2 micrometers.

[0054] In order to form a color layer on a base material film, a sublimability color, binder resin, and necessity can be accepted, and it can form by carrying out coating of the coating liquid dissolved, or distributed and obtained by independent solvents or these partially aromatic solvents, such as toluene, a methyl ethyl ketone, ethyl acetate, and isopropanol, in other components, and drying it on a base material film, by conventionally well-known methods, such as a gravure coat, a gravure reverse coat, and a roll coat.

[0055] A thermofusion nature ink layer is formed in the thermofusion nature colored ink which consists of a coloring agent and thermofusion nature vehicles, such as yellow, a Magenta, cyanogen, or black, and a thermofusion nature vehicle uses a thermofusion nature binder as a principal component, and contains other components if needed. An organic or inorganic pigment, a color, etc. can be used as a coloring agent.

[0056] Here, as a coloring agent of yellow, PY-138, PY-139, PY-151, etc. can be mentioned by Color Index display, for example. As a coloring agent of a Magenta,--177,--185,--208, etc. can be mentioned, for example. Moreover, as a coloring agent of cyanogen, PB-15, PB-15:1, PB-15:6, etc. can be mentioned, for example.

[0057] When forming a thermofusion black ink layer especially, as a coloring agent of



black, carbon black is used preferably. Also in an organic or inorganic pigment and a color, carbon black has the property good as a record material, and can print a clear alphabetic character and a clear mark by high concentration, such as having sufficient coloring concentration and not producing discoloration or fading according to light, heat, an elevated temperature, etc.

[0058] It is desirable to use either of the binder resin shown in 5 from following 1 as a thermofusion nature binder from a viewpoint of the adhesive property to a television sheet and scratch-proof nature.

1) It may replace with acrylic resin and 2 acrylic-resin + chlorinated rubber, a 3 acrylic-resin + vinyl chloride / vinyl acetate copolymer resin, 4 acrylic-resin + cellulose system resin, 5 vinyl chlorides / vinyl acetate copolymer resin, and the above-mentioned binder resin, a wax etc. may be used, and you may use it, adding a wax etc. to the above-mentioned binder resin. As an example of representation of a wax, a micro crystallin wax, carnauba wax, paraffin wax, etc. can be illustrated. furthermore, the Fischer Tropsch wax, various low-molecular-weight polyethylene wax, haze wax, yellow bees wax, spermaceti wax, IBOTAROU, a wool low, a shellac wax, a candelilla wax, and petrolatum part -- various waxes, such as a denaturation wax, fatty acid ester, and a fatty-acid amide, can also be used.

[0059] In order to form a thermofusion ink layer on a base material film, like the above-mentioned thermofusion nature fluorescence ink layer, coating of the coating liquid dissolved, or distributed and obtained by the solvent in the required material is carried out on a base material film, and it can be made to be able to dry or heating fusion of the required material can be carried out, and on a base material film, coating can be carried out and it can form by cooling. As for the thickness of a thermofusion nature ink layer, it is desirable for it to be determined from the relation of required coloring concentration and heat sensitivity, and to usually consider as the range of about 0.2-10 micrometers.

[0060] In addition to a fluorescence color imprint layer, an imprint nature protective layer can be prepared for Junji Men at the hot printing sheet of this invention. An imprint nature protective layer is imprinted by the image formation field after the image formation of a printed side is completed. The mixture of the resin which it could form [ resin ] by various kinds of resin used as a protective layer of a hot printing image from the former, for example, carried out silicone denaturation of polyester resin, polystyrene resin, acrylic resin, polyurethane resin, acrylic urethane resin, and these resin, and these resin, ionizing-radiation hardenability resin, ultraviolet-rays cutoff nature resin, etc. can be used for a protective layer.

[0061] Especially the protective layer containing ionizing-radiation hardenability resin

is excellent in plasticizer-proof nature or scratch-proof nature. A thing well-known as ionizing-radiation hardenability resin can be used, for example, it becomes impossible to add a photopolymerization initiator to the polymer or oligomer of radical polymerization nature if needed, and the constituent in which a bridge formation polymerization is possible can be used for it by ionizing radiation, such as an electron ray and ultraviolet rays.

[0062] Although the thickness of a protective layer is based also on the class of resin for protection stratification, it is desirable to usually consider as the range of about 0.5-10 micrometers.

[0063] A protective layer may be multilayer structure which consists of two or more layers from which a function differs, for example, the glue line may be formed in the maximum surface of a protective layer. A glue line can be formed by adhesive good resin at the time of heating like acrylic resin, vinyl chloride system resin, vinyl acetate system resin, a vinyl chloride / vinyl acetate copolymer resin, polyester system resin, and polyamide system resin. Usually let thickness of a glue line be the range of about 0.1-5 micrometers.

[0064] In order to form an imprint nature protective layer, it can form by carrying out coating of the spreading liquid for protective layers which independent solvents or these partially aromatic solvents, such as toluene, a methyl ethyl ketone, ethyl acetate, and isopropanol, were made to dissolve or distribute the resin for protection stratification, and was obtained, and drying it on a base material film or stratum disjunctum, by conventionally well-known methods, such as a gravure coat, a gravure reverse coat, and a roll coat. When ionizing-radiation hardenability resin is used, after drying a coating layer, ionizing radiation, such as ultraviolet rays and an electron ray, is irradiated, and a coating layer is hardened.

[0065] What is necessary is to prepare beforehand the spreading liquid for forming the spreading liquid for protective layers containing the resin for protection stratification, the spreading liquid for glue lines containing heat adhesive property resin, and the layer added if needed in addition to this in the case of the multilayer structure in which an imprint nature protective layer has an additional layer like the above-mentioned glue line, to apply them on a base material film or a mold release layer in predetermined sequence, and just to dry them. A suitable primer layer may be formed between each class.

[0066] A mold release layer is prepared between base material films and these layers so that it may be made to imprint easily a heat-of-fusion imprint mold fluorescent ink layer, a thermofusion nature ink layer, or an imprint nature protective layer from a hot printing sheet to a television sheet. A heat-of-fusion imprint mold fluorescent ink layer,

a thermofusion nature ink layer, or an imprint nature protective layer exfoliates in an interface with a mold release layer, and is imprinted by the television sheet, and a mold release layer remains on a base material film. This mold release layer is effective especially when easily-adhesive processing (adhesive improvement processing) like corona discharge treatment is performed to the base material film.

[0067] A mold release layer can be formed using urethane resin, polyvinyl-acetal resin, or those mixture. A mold release layer can be formed by dissolving or distributing the resin for mold release stratification with a solvent, considering as spreading liquid like the case of an above-mentioned fluorescence color imprint layer or an imprint nature protective layer, and carrying out coating on a base material film by the well-known method. As for the thickness, it is usually desirable to be referred to as about 0.1-5 micrometers.

[0068] It is desirable to prepare a heat-resistant layer in the field by the side of the back of the above-mentioned base material film (i.e., the direction in which the fluorescence color imprint layer is not prepared), in order to prevent welding with heating elements, such as a thermal head, or to improve feeding nature, or to prevent the blocking by the side of the back and a front face, when the hot printing sheet of this invention is rolled round in the shape of a roll.

[0069] Such a heat-resistant layer can be formed using resin, such as for example, hardenability silicone oil, silicone resin, a fluororesin, acrylic resin, and polyvinyl butyral resin, and the hardened material of those. Moreover, a surfactant and various fillers may be added for the purpose of controlling the slippage of a heat-resistant layer into a material which was described above. A heat-resistant layer can be formed by dissolving or distributing a heat-resistant stratification material with a solvent, considering as spreading liquid like the case of an above-mentioned fluorescence color imprint layer or an imprint nature protective layer, and carrying out coating on a base material film by the well-known method.

[0070] Next, how to form a fluorescence color image (forged prevention mark) is explained using the above-mentioned hot printing sheet.

[0071] The hot printing sheet which comes to prepare the fluorescence color imprint layer containing two or more sorts of organic fluorescence agents which emit the fluorescence of a color tone which is colorlessness mostly and is mutually different to the exposure of ultraviolet rays in this invention to the exposure of the light on a base material film is prepared. By opposing the fluorescence color imprint layer of the above-mentioned hot printing sheet to the image formation field of a printed side, heating said fluorescence color imprint layer according to superposition and the image information which should be printed, and carrying out the heat shift of the organic

fluorescence agent to a printed side The image which emits the fluorescence color which is color mixture by the exposure of ultraviolet rays can be formed.

[0072] Moreover, heavy printing can be performed on the hot printing sheet of this invention by opposing these imprint layers to the same image formation field of a printed side like a fluorescence color imprint layer, and carrying out superposition heating, when other imprint layers, such as a color layer, a thermofusion nature ink layer, and an imprint nature protective layer, are prepared for Junji Men with the fluorescence color imprint layer.

[0073] In this invention, since the image which emits the fluorescence of the new color tone in which color mixture was carried out by additive mixture of colors by making a printed side carry out the heat shift of the mixture of the colorless fluorescence agent of these two or more kinds from the fluorescence color imprint layer containing two or more sorts of colorless fluorescence agents which emit the fluorescence of a mutually different color tone to the exposure of ultraviolet rays can be formed, forged tightness more advanced than the conventional technique is realizable.

[0074] The fluorescence color of the color tone of arbitration including the white light can be made by mixing each color of red, blue, and green, after adjusting each reinforcement suitably. The usual color material absorbs the light and colors the complementary color. On the other hand, a colorless fluorescence agent absorbs ultraviolet rays, and colors the fluorescence of a visible color, and the color mixture follows the principle of additive mixture of colors. Therefore, if it is used combining the colorless fluorescence agent which emits the fluorescence of a different color tone, the fluorescence color of the various color tones containing white can be made to arbitration. Since the color tone of the fluorescence color obtained with color mixture may be changed to a stepless story by the combination and the blending ratio of coal of a colorless fluorescence agent, if the class and the blending ratio of coal of a colorless fluorescence agent which are used are not known, it is difficult to copy completely the color tone of the fluorescence color of a certain color mixture, and it can make counterfeit difficulty high by leaps and bounds compared with the case where the colorless fluorescence agent of only one color is used.

[0075] Since the image in which emits the color mixture by two or more fluorescence agents, and coloring concentration moreover carries out gradation change smoothly since it is possible to form a pattern when forming a fluorescence image in a printed side especially by the heat-of-sublimation imprint using a heat-of-sublimation imprint mold fluorescent dye layer can be formed, a fluorescence image with counterfeit, very high difficulty is obtained.

[0076] Furthermore, since the fluorescence color image created by this invention is

formed combining two or more sorts of fluorescence agents, a complicated fluorescence absorption spectrum can be completed, and when piling up and printing further the usual image which can be checked by looking by the light to the formation field of a fluorescence color image, in the image formation field concerned, a complicated ultraviolet-visible absorption spectrum and a fluorescence-visible absorption spectrum can be completed. Therefore, forged prevention means \*\*\*\*\* also with an effective means to judge truth or falsehood by using if needed, combining a predetermined color material further, performing hot printing, using it as "key" information for forged prevention of the ultraviolet-visible-absorption-spectrum configuration of an image and/or fluorescence-visible-absorption-spectrum configuration which are acquired, using a predetermined combination of a colorless fluorescence agent, and detecting this ultraviolet-visible-absorption-spectrum configuration and/or a fluorescence-visible-absorption-spectrum configuration.

[0077]

[Example] (Preparation of coating liquid) The coating liquid for heat-resistant layers of each presentation shown below, the coating liquid for mold release layers, the coating liquid for fluorescence color imprint layers, the coating liquid for thermofusion black ink layers, and the coating liquid for protective layers were prepared.

[0078] <the coating liquid for heat-resistant layers>, and polyvinyl-butyril-resin (S lek BX-1, Sekisui Chemical Co., Ltd. make): -- the 3.6 weight sections and poly isocyanate (bar knock D750, Dainippon Ink & Chemicals, Inc. make): -- the 8.6 weight sections and a phosphoric ester system surfactant (ply surfboard A208S --) The Daiichi Pharmaceutical industry Make : The 2.8 weight sections and talc the micro ace P-3 -- a Japanese talc industry Make: -- the 0.7 weight sections and methyl-ethyl-ketone: -- the 32.0 weight sections and toluene: -- 32.0 weight sections <the coating liquid for mold release layers>, and urethane resin (made in [ DIC ] Chris Bon 9004): -- the 20.0 weight sections and polyvinyl aceto acetal resin (KS-5 -- Sekisui Chemical) Make: -- the 5.0 weight sections and dimethyl HORUMUARUMAIDO: -- the 80.0 weight sections and methyl-ethyl-ketone: -- the 120.0 weight sections <coating liquid 1 for fluorescence color imprint layers>, and organic system red fluorescence agent (LC0001, Nippon Kayaku Co., Ltd. make): -- 1 weight section and an organic system green fluorescence agent (EG502, Mitsui Chemicals, Inc. make) :1 weight section and an organic system blue fluorescence agent (YUBITEKKUSU alumnus --) Ciba-Geigy: -- 1 weight section and a vinyl chloride vinyl acetate copolymer resin solution (# -- 1000 AKT) : by DENKI KAGAKU KOGYO K.K. -- the 100.0 weight sections and toluene: -- the 150.0 weight sections and methyl-ethyl-ketone: -- the 150.0 weight sections <coating liquid 2 for fluorescence color imprint layers>, and inorganic system red fluorescence agent

(Y<sub>2</sub>O<sub>3</sub>:Eu): -- the 0.5 weight sections and an inorganic system green fluorescence agent (ZnS:Cu) aluminum) -- :0.5 weight section and an inorganic system -- blue -- the fluorescence agent (calcium<sub>2</sub>B<sub>5</sub>O<sub>9</sub>Cl:Eu<sup>2+</sup>):0.5 weight section and a vinyl chloride vinyl acetate copolymer resin solution (# -- 1000 AKT) : by DENKI KAGAKU KOGYO K.K. -- the 100.0 weight sections and toluene: -- the 150.0 weight sections and methyl-ethyl-ketone: -- the 150.0 weight sections <coating liquid 3 (blue monochrome) for fluorescence color imprint layers>, and an organic system blue fluorescence agent (YUBITEKKUSU alumnum --) Ciba-Geigy: -- 1 weight section and a vinyl chloride vinyl acetate copolymer resin solution (# -- 1000 AKT) DENKI KAGAKU KOGYO Make: -- the 100.0 weight sections and toluene: -- the 150.0 weight sections and methyl-ethyl-ketone: -- the 150.0 weight sections <coating liquid 4 (red monochrome) for fluorescence color imprint layers>, and organic system red fluorescence agent (LC0001, Nippon Kayaku Co., Ltd. make): -- 1 weight section and a vinyl chloride vinyl acetate copolymer resin solution # -- 1000 AKT DENKI KAGAKU KOGYO Make: -- the 100.0 weight sections and toluene: -- the 150.0 weight sections and methyl-ethyl-ketone: -- the 150.0 weight sections <coating liquid 4 (green monochrome) for fluorescence color imprint layers>, and organic system green fluorescence agent (EG502, Mitsui Chemicals, Inc. make): -- 1 weight section and a vinyl chloride vinyl acetate copolymer resin solution # -- 1000 AKT DENKI KAGAKU KOGYO Make: -- the 100.0 weight sections and toluene: -- the 150.0 weight sections and methyl-ethyl-ketone: -- the 150.0 weight sections <coating liquid 1 (yellow) for color layers>, and disperse dye (holon brilliant-yellow-S-6GL): -- the 5.5 weight sections and binder resin polyvinyl aceto acetal resin KS-5 -- Sekisui Chemical Make: -- the 4.5 weight sections and polyethylene wax: -- the 0.1 weight sections and methyl-ethyl-ketone: -- the 45.0 weight sections and toluene: -- the 45.0 weight sections <coating liquid 2 (Magenta) for color layers>, and disperse dye (MS red): -- the 1.5 weight sections and a disperse dye : ((R) Macro REXX red violet) The 2.0 weight sections and binder resin polyvinyl aceto acetal resin KS-5 -- Sekisui Chemical Make: -- the 4.5 weight sections and polyethylene wax: -- the 0.1 weight sections and methyl-ethyl-ketone: -- the 45.0 weight sections and toluene: -- the 45.0 weight sections <coating liquid 3 (cyanogen) for color layers>, and disperse dye (kaya set blue 714): -- the 4.5 weight sections and binder resin polyvinyl aceto acetal resin KS-5 -- Sekisui Chemical Make: -- the 4.5 weight sections and polyethylene wax: -- the 0.1 weight sections and methyl-ethyl-ketone: -- the 45.0 weight sections and toluene: -- 45.0 weight sections <the coating liquid for thermofusion black ink layers>, and a vinyl chloride vinyl acetate copolymer resin solution (# -- 1000 AKT) : by DENKI KAGAKU KOGYO K.K. -- the 20.0 weight sections and carbon black: -- the 10.0 weight sections and a methyl ethyl ketone / toluene (weight ratios 1/1): -- 70.0 weight sections

<the coating liquid for protective layers>, and vinyl chloride vinyl acetate copolymer resin (# -- 1000 AKT) : by DENKI KAGAKU KOGYO K.K. -- the 100.0 weight sections and toluene: -- the 150.0 weight sections and methyl-ethyl-ketone: -- to one field of a processed [ easily-adhesive ] polyethylene terephthalate film with a 150.0 weight sections (creation of base material film for hot printing sheets) thickness of 6 micrometers The gravure coating machine was used, and the above-mentioned coating liquid for heat-resistant layers was applied at a rate of 0.8 g/m<sup>2</sup> by solid content conversion, it dried, and the heat-resistant layer was formed. Thus, the hot printing sheet of each example later mentioned using the created base material film was created.

[0079] (Example 1) Using the gravure coating machine, with having prepared the heat-resistant layer of said base material film for hot printing sheets, said coating liquid for mold release layers was applied to the field of the opposite side at a rate of 1 g/m<sup>2</sup> by solid content conversion, it dried to it, and the mold release layer was formed in it. Next, said coating liquid 1 for fluorescence color imprint layers was applied and dried at a rate of 1 g/m<sup>2</sup> by solid content conversion on said mold release layer, the fluorescence color imprint layer was formed, and the hot printing sheet 1 was created.

[0080] (Example 2) In said example 1, the hot printing sheet 2 was created like the example 1 except having used the coating liquid 2 for fluorescence color imprint layers instead of the coating liquid 1 for fluorescence color imprint layers.

[0081] With having prepared the heat-resistant layer of said base material film for hot printing sheets, using a photogravure printing machine, (Example 3) To the field of the opposite side Said coating liquid 1 (yellow) for color layers, said coating liquid 2 (Magenta) for color layers, It applied at a rate of 1 g/m<sup>2</sup> by solid content conversion by the above-mentioned sequence at Junji Men, respectively, said coating liquid 3 (cyanogen) for color layers and the coating liquid 1 for fluorescence color imprint layers were dried, the color layer of each color and the fluorescence color imprint layer were formed, and the hot printing sheet 3 was created. In addition, along the flow direction of a base material film, each color layer and a fluorescence color imprint layer are every 15cm in length, and placed and formed the 1cm crevice.

[0082] (Example 4) In said example 3, the hot printing sheet 4 was created like the example 3 except having formed the thermofusion black ink layer by Junji Men with the color layer and the fluorescence color imprint layer. After having used the photogravure printing machine, having applied, drying said coating liquid for mold release layers in the location between the color layer (cyanogen) of the base material film surface, and a fluorescence color imprint layer at a rate of 1 g/m<sup>2</sup> by solid content conversion and forming a mold-release layer in it, said coating liquid for thermofusion black ink layers was applied and dried at a rate of 0.7 g/m<sup>2</sup> by solid-content conversion on said mold

release layer by using a photogravure printing machine, and the thermofusion black ink layer was formed. The multilayer-structure portion which consists of a mold release layer and a thermofusion black ink layer placed and formed the 1cm crevice forward and backward by length of 15cm along the flow direction of a base material film like other imprint layers.

[0083] (Example 5) In said example 3, the hot printing sheet 5 was created like the example 3 except having formed the imprint nature protective layer by Junji Men with the color layer and the fluorescence color imprint layer. After having used the photogravure printing machine, having applied, drying said coating liquid for mold release layers in the next location of the fluorescence color imprint layer of the base material film surface at a rate of 1 g/m<sup>2</sup> by solid content conversion and forming a mold release layer in it, said coating liquid for protective layers was applied and dried at a rate of 0.8g/m<sup>2</sup> by solid content conversion on said mold release layer by using a photogravure printing machine, and the imprint nature protective layer was formed. The multilayer-structure portion which consists of a mold release layer and an imprint nature protective layer placed and formed the 1cm crevice forward and backward by length of 15cm along the flow direction of a base material film like other imprint layers.

[0084] (Example 1 of a comparison) Instead of the coating liquid 1 for fluorescence color imprint layers, the hot printing sheet 6 of the example of a comparison was created like the example 1 except having used the coating liquid 3 for fluorescence color imprint layers of blue monochrome.

[0085] (Example 2 of a comparison) Instead of the coating liquid 1 for fluorescence color imprint layers, the hot printing sheet 7 of the example of a comparison was created like the example 1 except having used the coating liquid 4 for fluorescence color imprint layers of red monochrome.

[0086] (Example 3 of a comparison) Instead of the coating liquid 1 for fluorescence color imprint layers, the hot printing sheet 8 of the example of a comparison was created like the example 1 except having used the coating liquid 5 for fluorescence color imprint layers of green monochrome.

[0087] (The evaluation method and result) The print object was created and evaluated on condition that the following using the hot printing sheet created in the above example and example of a comparison. In addition, all hot printing television sheets used L size paper A4 for color printers P-400 of Olympus Optical Co., Ltd.

[0088] While the hot printing sheet 1 and the above-mentioned hot printing television sheet which were created in the <creation of print object 1> example 1 were put between superposition, the thermal head, and the platen roll and carried out the pressure welding, after impressing energy 160 mJ/mm on condition that 2 and printing speed



33.3 msec/line (delivery pitch 6line/mm), both were exfoliated and the image which consists of a colorless fluorescence agent was formed on the hot printing television sheet. [0089] Under the light, when the image which consists of an obtained colorless fluorescence agent is almost difficult to check by looking at colorlessness and the commercial black light (luminescence wavelength of 365nm) was irradiated, the image formation portion showed luminescence of outline white, and has checked it by looking clearly.

[0090] The image which consists of a colorless fluorescence agent was formed on the hot printing television sheet using the hot printing sheet 2 obtained in the <creation of print object 2> example 2 on the same printing conditions as creating the above-mentioned print object 1.

[0091] Although the image which consists of an obtained colorless fluorescence agent can discover existence of a printing image depending on the angle which it is almost white and is seen under the light, it was difficult the image to check details, such as a detailed pattern. When the black light (luminescence wavelength of 365nm) of marketing in this fluorescence color image was irradiated, the image formation portion showed luminescence of outline white, and has checked by looking clearly.

[0092] Using the hot printing sheet 3 obtained in the <creation of print object 3> example 3, the sequential imprint of yellow, a Magenta, each sublimability color of cyanogen, and the fluorescence color of color mixture was carried out into the same field on a television sheet, and the visible image and the fluorescence color image were formed.

[0093] While the hot printing sheet 3 and the above-mentioned hot printing television sheet were put between superposition, the thermal head, and the platen roll and carried out the pressure welding, printing of Y, M, and C each color was performed from the rear face of the hot printing sheet 3 on condition that head applied-voltage 12.0 V, pulse width 16msec, print period 33.3msec and 6 dots of dot densities / line, and the full color image was formed. Then, the image which consists of a colorless fluorescence agent on the same printing conditions as creating the above-mentioned print object 1 was formed in the same image formation field.

[0094] Under the light, the obtained image has recognized only the full color image originating in a sublimability color, but seemed not to be different from the usual thermal-transfer-recording image at all. However, when the black light (luminescence wavelength of 365nm) of marketing in this image was irradiated, the image formation portion showed luminescence of outline white, and has checked by looking clearly.

[0095] Using the hot printing sheet 4 obtained in the <creation of print object 4> example 4, the sequential imprint of yellow, a Magenta, each sublimability color of

cyanogen, thermofusion nature black ink, and the fluorescence color of color mixture was carried out into the same field on a television sheet, and the full color visible image, the black alphabetic character image, and the fluorescence color image were formed.

[0096] Printing of Y, M, and C each color was performed on the same printing conditions as creating superposition and the above-mentioned print object 3 for the hot printing sheet 4 and the above-mentioned hot printing television sheet, and the full color image was formed. Then, thermofusion black ink was printed to the same image formation field 120 mJ/mm on condition that 2 and printing speed 33.3 msec/line (delivery pitch 6line/mm), and the black alphabetic character image was formed in it. Then, the image which consists of a colorless fluorescence agent on the same printing conditions as creating the above-mentioned print object 1 was formed in the same image formation field.

[0097] Under the light, the obtained image has recognized only the full color image originating in a sublimability color, and the black alphabetic character image originating in thermofusion nature black ink, but seemed not to be different from the usual thermal-transfer-recording image at all. However, when the black light (luminescence wavelength of 365nm) of marketing in this image was irradiated, the image formation portion showed luminescence of outline white, and has checked by looking clearly.

[0098] While carrying out the sequential imprint of yellow, a Magenta, each sublimability color of cyanogen, and the fluorescence color of color mixture into the same field on a television sheet and forming the full color visible image and the fluorescence color image using the hot printing sheet 5 obtained in the <creation of print object 5> example 5, the protective layer was imprinted and covered on the formed image.

[0099] After performing printing of Y, M, and C each color on the same printing conditions as creating superposition and the above-mentioned print object 3 for the hot printing sheet 5 and the above-mentioned hot printing television sheet and forming a full color image, the image which consists of a colorless fluorescence agent on the same printing conditions as creating the above-mentioned print object 1 was formed in the same image formation field. Then, hot printing of the imprint nature protective layer was carried out 160 mJ/mm on condition that 2 and printing speed 33.3 msec/line (delivery pitch 6line/mm), and the image was covered.

[0100] Under the light, the obtained image has recognized only the full color image originating in a sublimability color, but seemed not to be different from the usual thermal-transfer-recording image at all. However, when the black light (luminescence wavelength of 365nm) of marketing in this image was irradiated, the image formation

portion showed luminescence of outline white, and has checked by looking clearly.

[0101] The image which consists of a colorless fluorescence agent on the same printing conditions as creating the above-mentioned print object 1 was formed except having used the hot printing sheet 6 obtained in the example 1 of a <creation of comparison print object 6> comparison.

[0102] Under the light, when the image which consists of an obtained colorless fluorescence agent is almost difficult to check by looking at colorlessness and the commercial black light (luminescence wavelength of 365nm) was irradiated, the image formation portion showed blue luminescence and has checked it by looking clearly. However, the color tone of the fluorescence color emitted from an image was a color tone of the fluorescence agent itself blended with the fluorescence color imprint layer.

[0103] The image which consists of a colorless fluorescence agent on the same printing conditions as creating the above-mentioned print object 1 was formed except having used the hot printing sheet 7 obtained in the example 2 of a <creation of comparison print object 7> comparison.

[0104] Under the light, when the image which consists of an obtained colorless fluorescence agent is almost difficult to check by looking at colorlessness and the commercial black light (luminescence wavelength of 365nm) was irradiated, the image formation portion showed luminescence of red and has checked it by looking clearly. However, the color tone of the fluorescence color emitted from an image was a color tone of the fluorescence agent itself blended with the fluorescence color imprint layer.

[0105] The image which consists of a colorless fluorescence agent on the same printing conditions as creating the above-mentioned print object 1 was formed except having used the hot printing sheet 8 obtained in the example 3 of a <creation of comparison print object 8> comparison.

[0106] Under the light, when the image which consists of an obtained colorless fluorescence agent is almost difficult to check by looking at colorlessness and the commercial black light (luminescence wavelength of 365nm) was irradiated, the image formation portion showed luminescence of green and has checked it by looking clearly. However, the color tone of the fluorescence color emitted from an image was a color tone of the fluorescence agent itself blended with the fluorescence color imprint layer.

[0107]

[Effect of the Invention] As explained above, according to the hot printing method concerning this invention, the fluorescence agent which emits the fluorescence of a color tone which is colorlessness mostly and is mutually different to the exposure of ultraviolet rays to the exposure of the light into the image formation field of a printed side from the fluorescence color imprint layer contained two or more sorts By carrying

out the heat shift of the mixture of a colorless fluorescence agent, by the light, the fluorescence image which has the color tone of the arbitration which cannot be recognized can be formed, and high forged tightness can be given to a print object.

[Brief Description of the Drawings]

[Drawing 1] It is the typical cross section showing an example of the hot printing sheet concerning this invention.

[Drawing 2] It is the typical cross section showing another example of the hot printing sheet concerning this invention.

[Drawing 3] It is the typical cross section showing another example of the hot printing sheet concerning this invention.

[Drawing 4] It is the typical cross section showing another example of the hot printing sheet concerning this invention.

[Drawing 5] It is the typical cross section showing another example of the hot printing sheet concerning this invention.

[Description of Notations]

1 -- Base material film

2a -- Heat-of-fusion imprint mold fluorescent ink layer

2b -- Heat-of-sublimation imprint mold fluorescent dye layer

3 -- Mold release layer

4 -- Heat-resistant layer

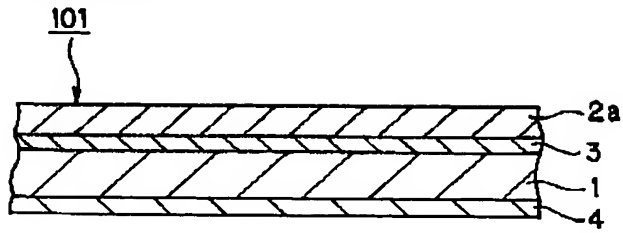
5 -- Color layer

6 -- Thermofusion nature ink layer

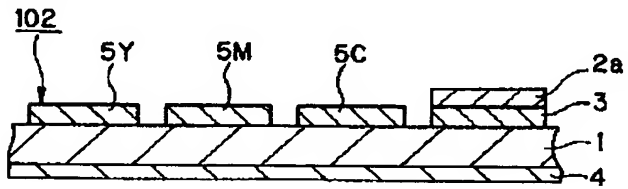
7 -- Thermofusion black ink layer

8 -- Imprint nature protective layer

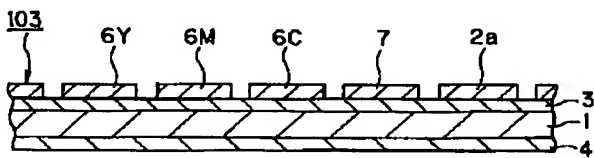
[Drawing 1]



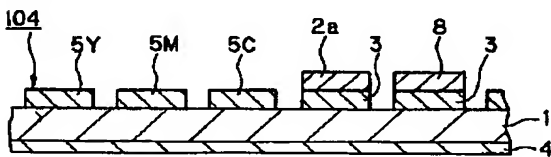
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Drawing 5]

